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The ICT Skills plan and the Higher Diploma in Science in Computing Graduate Conversion programme: An example of Government, Third Level and Industry engaging to address a specific skills deficit in the Irish economy

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Abstract

The past 15 years have been ones of rapid change not only in the ever growing impact of ICT on everyday life but also locally in terms of talent development and delivery for ICT graduates. One of the critical issues identified for Ireland and indeed internationally, has been a shortage of Level 8 Graduates in Computing and Computer Science. Enterprise Ireland, Forfás, the HEA, the IDA, Industry bodies such as ICT Ireland, The Irish Computer Society, Engineers Ireland and IBEC as well as government departments recognised the criticality of supply of talented graduates to Ireland's ICT sector and took measures to correct the situation culminating in the 2014-2018 ICT Skills plan.

A key response measure aimed at addressing the ICT Skills shortages was the funding of a call in late 2011 for graduate conversion programmes aimed at converting numerate graduates from disciplines other than computing who worked in declining sectors of the economy into graduates with ICT Skills sufficient to take up graduate level roles in the ICT sector.

This paper discusses the formation of an Institute of Technology based consortium, including DIT, ITB and IT Tallaght to respond to the call for graduate conversion programmes. Discussed is the range of industry partners included in the consortium, their contribution to the development of the programme and their subsequent engagement with the programme. Also discussed are the very positive outputs from the first cycles from the programme including the employment successes and the actual range of roles obtained by graduates of the programme. Included in the paper are feedback and learning from each of industry, Institutes and student participants.

Keywords: Computing ICT Skills Graduate Conversion Industry Engagement

1. Computer Science and Computing – Developing Disciplines.

The last two decades have been ones of rapid change not only in the ever growing impact of ICT on everyday life but also locally in terms of talent development and delivery for the ICT. Vast application ecosystems such as Google, Facebook and Twitter have engaged a hitherto unimaginable proportion of the population of the world and at the same time driven demand for graduates not only with computing skills but also with new forms of skill in data analytics, social media analysis and even IT infrastructure provision.

Predictions are that graduate demand will stay strong in the foreseeable future – as a nation we need to reflect on the mix and proportion of graduates that we are producing (and of course, resource this production) and tune this mix to address these opportunities or else face the consequences of producing the wrong mix of graduates for the Irish economy. Over the same two decades ICT graduate supply has gone through a roller coaster from the highs of the late 90's to rapid decline which followed the 'dot-bomb' and latterly the Irish construction boom.

Fluctuations in local graduate supply have in part been compensated for by the recruitment of overseas graduates. The willingness of skilled overseas

graduates to move to Ireland is to be welcomed making the Irish ICT sector a truly international place to work and enhancing the overall quality of the ICT cluster in Ireland. However if Ireland wishes to develop further its ICT sector and access the opportunities that the global ICT business offers then Ireland needs to ramp up the production of ICT graduates thus helping to anchor the ICT industry in Ireland.

1.1 ICT industry in Ireland

With 9 of the top 10 global software companies, the top 10 born on the internet companies and 4 of the top 5 IT Services companies having significant bases in Ireland, Ireland has been successful in attracting major ICT employment to the country. Technology industries in Ireland employ 105,000 people and account for €72 billion in exports. There is a fast growing indigenous digital technology sector with many start-up companies. A key attractor and enabler for these companies is having a sustainable supply of talented graduates to supply the sector.

Multiple reports from The Expert Group in Future Skills Needs (EGFSN 2012, 2013, 2014) have signalled that there are opportunities for the fast growing ICT Sector to grow even further in Ireland. As well as a greater volume, a broader range of ICT graduates is needed. Computing and Computer Science related skills have become a greater proportion of the graduate supply that a modern economy determined to support a significant ICT centre needs to produce.

With its latest 'Action Plan for Jobs' the government has demonstrated an intention to make the most of this opportunity:

'Through strengthened collaboration between Government, the education system and industry and as part of the goal of making Ireland the most attractive location in the world for ICT skills and ability, implement the key actions from the ICT Skills Action Plan 2014- 2018.'

Action Plan for Jobs 2015. Department of Jobs, Enterprise & Innovation.

1.2 Academic-Industry Engagement & The Third Level Computing Industry Forum

Computing and Computer Science as a domain is unusual in the Irish context in that there has been for around 20 years a forum (The Third Level Computing Forum) which meets five times per year to discuss areas of common interest between Third Level Universities and Institutes of Technology who supply Software Development Graduates, public bodies such as Enterprise Ireland and Industry. This forum provides a venue for the development of links between colleges and industry, for the development of submissions to various branches of government in relation to second level subjects, funding mechanisms and ICT Skills strategy in the country.

Computer Science graduates have the highest level of employment with 77% of graduates employed nine months after graduation.

What do graduates do? HEA Dec. 2014.

There is a case to be made that the effect of regular meetings and discussions of academic department heads, government organisations and

representatives from the ICT sector have played a role in maintaining the industry relevance and quality of degree provision in computer science.

1.3 Improvement in ICT Student Numbers.

With improved communications from all TLF partners, numbers attracted to courses in these new knowledge areas have grown substantially since 2008. The pipeline of talent coming through the Computing and Computer Science programmes in colleges is now much stronger.

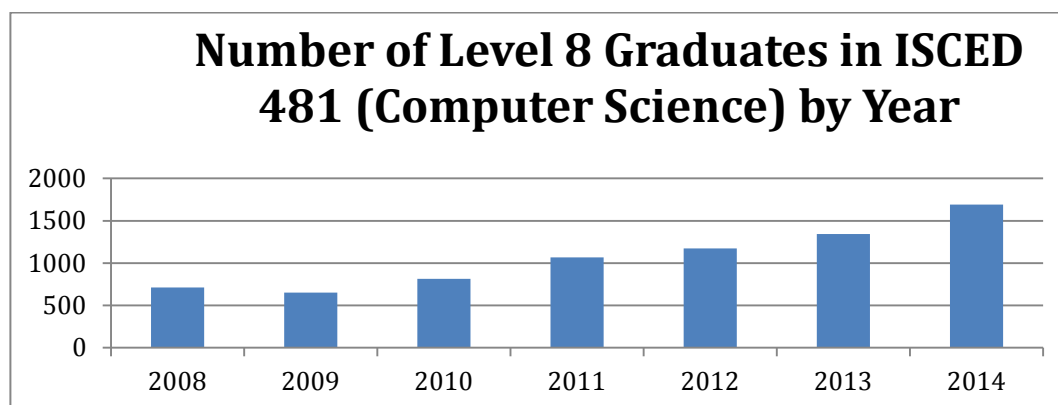


Figure 1: Numbers of Level 8 Computer Science graduates (Addressing Future Demand for High-Level ICT Skills, EGFSN, Forfás, November 2013, note 2013/4 projected)

Yet strong as the growth has been in core computing programmes, recent work by Forfás (Addressing Future Demand for High-Level ICT Skills, Forfás, 2013) has indicated further opportunity open to Ireland. This led to the adoption by the Irish Government of an ambitious target in their Action Plan for Jobs:

We will increase higher education ICT graduates by 60 per cent between 2015 and 2018, commensurate with resourcing, meeting 74 per cent of demand through domestic supply in 2018.

Action Plan for Jobs 2015. Department of Jobs, Enterprise & Innovation.

2 The ICT Skills Funded Graduate Conversion Programme

Almost exactly in parallel to the decline in Software Graduate production, Ireland was going through an economic crisis leading to a sharp increase in numbers unemployed. The economic crisis may have crystallised in 2008 but the rise in unemployment peaked in February 2012. Forfás analyses of these figures showed significant numbers of graduates from numerate backgrounds such as Civil and Manufacturing Engineering. These numerate graduates with experience of industry and problem solving skills, many of whom were mature, with family ties and not necessarily mobile, were considered to be prime candidates for a graduate conversion programme.

With Forfás analysis (EGFSN, 2012) identifying the key shortage in graduate supply at level 8 (B. Sc. Hons.) the obvious solution was to develop intensive one year graduate conversion programmes.

Following representations from industry and discussions, at the third level forum, among other places, the HEA decided to fund a graduate conversion programme under the ICT Skills brand. HEA expectations set for this graduate conversion programme were:

- As the programme was directly targeted at supporting industry needs then Industry would be expected to engage with and support the programme.
- Graduates of the programme would be expected to find work in the areas of skill shortage within the ICT Sector.
- Placement in industry would be a key element of the programme.

Government wanted to see real measurable outputs from the programmes and real investment by industry in the programme. Evidence of intent was clear in the proposed marking scheme.

- Programme links with employer/industry needs and labour market opportunities [50 marks]
- Programme Approach and Progression Opportunities [30 Marks]
 - Understanding and analysis of the learner cohort [15 Marks]
 - Progression Opportunities [15 Marks]
- Cost and Value for Money [20 Marks]

In a sense industry support was being used as a proxy measure of programme quality and relevance. The insistence on postgraduate progression compatibility was also an interesting measure.

2.1 Higher Diploma Programme Structure.

The expert group who designed the programme on behalf of the HEA were very specific about the academic content and admissions criterion required for programme proposals. The basic structure of the programme mandated is outline in Figure 2. For the first round of funding, two sample sets of syllabi were drawn up for Software and IT Infrastructure specialisms. However Institutions and their industry partners had the flexibility to be able to offer any specialisation built on the core knowledge which they felt appropriate. In later calls a specification for a data analytics specialisation was also added.

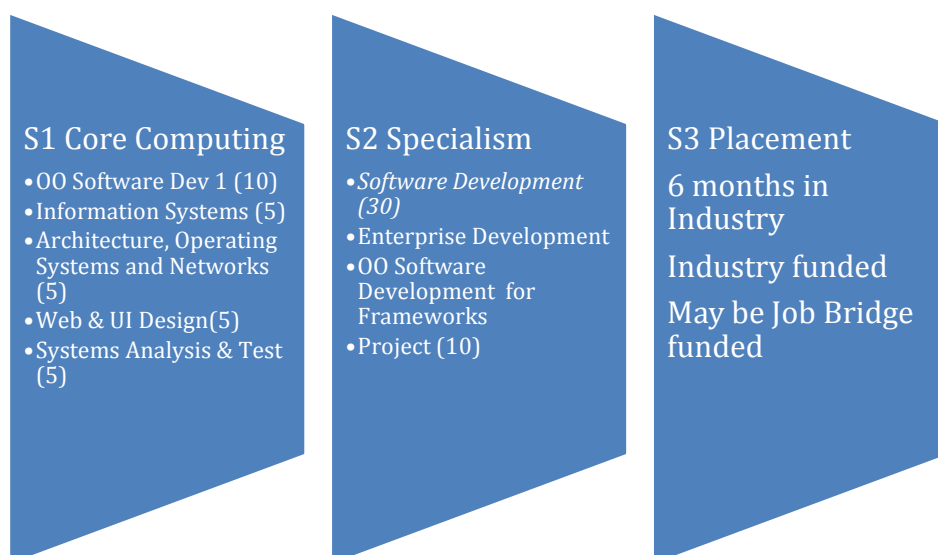


Figure 2. Example of Higher Diploma in Science in Computing as set out in HEA tender call document

2.2 Institute of Technology Consortium

In response to the call a number of Institutes of Technology decided to form a consortium to make a common application for funding under the scheme. A consortium approach was seen as providing certain advantages:

- Programme development teams would have a wider pool of expertise to draw from in developing the programmes.
- A more consistent graduate would emerge from the programmes resulting in a better known brand for the Higher Diploma.
- Employers would have a single point of contact for a group of Institutes.

The Institutes who formed the original consortium were:

IT Blanchardstown	IT Carlow	IT Sligo	IT Tralee	Galway Mayo IT
DIT	Waterford IT	Limerick (Tipp) IT	IT Tallaght	(Co-ordinators)

Table 1: Academic Partners in the IoT Consortium

Over the period leading up to the submission of the proposal these Institutes met regularly to develop the consortium approach proposal. A number of key points were agreed:

- Each Institute could develop/ adjust their particular programme to the call.
- Sufficient commonality had to be maintained to allow transfer of students between Institutes at the end of Semester 1.
- Because of the short time between call and implementation the IT Tallaght syllabi were available for franchise by any Institute in the consortium requiring a validated programme to respond to the call.
- Students were to be given the flexibility to move between Institutes to access a specialisation better suited to their abilities.

- Course notes were shared where requested by Institutes.
- Placement partners were pooled between institutes for the purposes of application but respect to be given to particular links held by Institutes.

Consortium meetings were arranged with partners such as Microsoft, IBM, Ergo, Version 1, CODEC DSS. Discussions were held and documents were circulated focusing on the major skills needs of the companies. It soon became clear that companies were seeking graduates with excellent core knowledge and practical hands on building skills but not necessarily expecting graduates to have specific experience in proprietary products. It was accepted that specific product experience was an unrealistic expectation although competence in at least one technology stack was vital.

2.2 Programme Recruitment

The Institute of Technology consortium was successful in obtaining funding for over 300 places. For the first running of the programme the HEA invested in a significant promotional budget which was amplified by contributions from Institutes and employers. Microsoft Ireland hosted and promoted an event 'Career Reboot' in their Sandyford HQ. This event, manned by volunteers from colleges and Microsoft Ireland was a major success with over 2,000 interested parties attending the open day.

2.3 Programme Delivery

Programmes commenced around March 2012 with most successful students entering their placements in January February 2013 – less than one year after commencing the programme and only slightly over one year after the call was made.

Industry engagement was maintained through the programme with speakers from industry partners visiting classes and speaking on technologies and opportunities. A careers fair was organised for July 2012 in DIT which was attended by students from many partner colleges and over 12 industry partners.

2.4 Programme Outcomes

The ICT Skills programme was subject to an independent evaluation by outside consultants following its first running. Selected outcomes are given below:

Academic Outcome	Number	Graduated	Withdrew	Pending
Overall	790	511	215	64
	100%	65%	27%	8%
IT Tallaght	27	17	9	1
	100%	63%	33%	4%

Table 2: Academic Outcomes for IT Tallaght and for Overall Programme

Employment Outcome	Number	Employed	Further Study	Seeking Work
Overall	584	328	24	232
	100%	56%	4%	40%
IT Tallaght	23	19	1	3
	100%	83%	4%	13%

Table 3: Employment Outcomes for IT Tallaght and for Overall Programme

For this paper we will focus on IT Tallaght outcomes vis-à-vis national outcomes are the detail on this outcomes are available to the author. A broader based comparison is in preparation. The overall national programme can be deemed a success with 328 additional level 8 graduates supplied into an ICT sector which was actively seeking these recruits.

The IT Tallaght academic outcomes are below the national average but the story is not a simple one.. Each academic non completion has an individual story behind it, in some cases illness; in some cases the participant received a position in their original industry. It can be seen that IT Tallaght employment figures are excellent at 83% with the absolute number (19) higher than the number of completions.

The source of this apparent anomaly was caused by a number of technology graduates who had graduated 10-15 years previously and were admitted to the programme. These students successfully obtained employment based on their semester 1 results. Some of these candidates had reported difficulty in securing interviews prior to participating on the programme.

2.5 Quality of Positions Obtained

The top employers of IT Tallaght graduates from the graduate conversion programme have been SAP, Ergo Systems and Version 1. Based on employment success, the successful graduates of the Higher Diploma programme are considered of an equivalent standard to four year undergraduates for many roles. The accepted view from these employers is that these graduates can bring a different maturity, life experience and determination to succeed to their work and that this more mature view can complement the fresh undergraduate from a four year programme within the organisation. 'We recognise the benefit of a few grey hairs' is a quote from one senior executive.

The most frequent role for graduate of the programme are SAP SAC/ COE (30%), Software Developer (Various) (25%), Technical support (20%), Infrastructure (15%) BI/ Database (10%).

2.6 Employer Feedback

Employer feedback has been very positive in respect of graduates of the programme. This is evidenced by the ongoing positive engagement and feedback from employer partners.

Version 1 (Version1, 2015) have stated that they feel there are two main reasons for the success of the conversion programme, (i) the calibre of the candidates that make it onto the programme and (ii) the range of content in the programme aligns well with Version1's needs. Thus the candidates become productive resources integrated into teams in less time. Ergo Systems (Purdy 2015) have stated that they see the programme fulfilling an important role in the Irish labour market and that they have recruited graduates from the programme and are happy to continue supporting the programme.

SAP Ireland have stated that the Higher Diploma programme 'fulfils an important role in the Irish labour market' and 'Through our longstanding partnership with IT Tallaght we have directly benefitted from this talent pipeline'. Another outcome from the Tallaght programme has been the development of two start-up companies by graduates of the programme in the Institute's Industry incubator centre (The Synergy Centre).

2.7 Graduate Feedback

Perhaps unsurprisingly with an 83% employment success rate, graduate feedback from the programme has also been very positive. Graduates have shown their appreciation by coming back to subsequent groups to advise them on the programme and their experience on it. Some typical comments are included here:

'I have recommended this course, and IT Tallaght in particular to a number of my friends, should the opportunity to apply arise again.'
(Structural Engineer 10 years experience)

'Overall my experience with this programme was massively positive and I would recommend it to prospective students.' *'Advice: Realise that the course is extremely intensive and requires a huge time commitment.'* (Production Engineer, 10+ yrs experience)

'The course itself has an exceptionally practical focus, which I have found is hugely attractive to prospective employers.' (Sales & Marketing 20+ years).

'Really enjoyed the course. I think the organisation of the course material was fantastic. The workload, although very intense, was well structured and gave a steady environment to keep learning at a fast pace.' (Creative Media 6 years)

3 Reflections on the Programme

The ICT Skills funded Graduate Conversion Programme was born at a key point in the economic cycle when Ireland was simultaneously facing a huge rise in unemployment and yet ICT employers had unfilled opportunities for graduates. The HEA and Government response was swift. It was clear that the government agenda was to try to tackle twin issues, namely

- More direct alignment of ICT programmes in academia with industry needs.
- More direct engagement and support from industry for academia. With the government investing scarce resources in preparing additional

graduates to fill industry needs there was a desire to see industry to move from a position of critical customer for graduates to one of engaged partner in graduate development.

The first point perhaps implies that third level institutions don't provide the graduates that industry requires and is one which has been the subject of numerous explosive comments over the years. It isn't proposed to analyse this in a short paper such as this. ICT graduate providers have been working in this environment for many years now. The reality is that a typical honours degree programme takes 4 years to complete and at least a further year to develop and prepare. One could say that technology based degree programmes can never be in a position to deliver exact current technologies needed at the point of graduation. Mostly industry accepts this and want people with excellent core knowledge in the field and the ability to learn.

Rather than mediating the discussion through the media more real impact and real progress is often achieved through engagement of the right partners through professional bodies and forums such as the Third Level Computing Forum.

3.1 Industry inputs

On the second bullet point in section 3 it is clear that industry has engaged well with the Graduate Conversion Programme. Briefly the following supports were typically provided by industry:

- Significant input on syllabus formation.
- Significant access to software and other resources for delivery of the programme.
- Guest speakers to classes on both industry topics and preparation for work in the industry.
- Participation in specific Careers Fairs
- Attention to Graduate Conversion applicants in their recruitment processes.
- Feedback in relation to the performance of graduates in interviews and in work.

What might have been expected from a closer integration with industry but did not materialise on a large scale were items such as

- Project specifications / Ideas for laboratory work.
- Direct teaching of modules on programmes.
- 'Special' Recruitment of Graduate Conversion programme candidates.

For a graduate conversion programme, this means that academic staff on ICT programmes need to be current, have industry knowledge, as well be prepared to develop new materials on a regular basis and have access to the resources and materials needed to carry out this work. They need also to be able to discriminate between relevant new technological approaches and technological fads.

3.1.1. Industry Driven Programmes. It is appropriate for a short intensive government funded programme such as a graduate conversion programme to have tightly coupled industry connections and syllabi. There is also need to produce research ready graduates in Computer Science if we

are to sustain the industry in Ireland. All degree programmes should be capable of producing graduates relevant to the ICT industry but all programmes shouldn't have such a tight coupling to technologies.

3.2 Outcomes Focused Metrics

Given the fiscal tightness at the time of launch of the programme it was no surprise that the HEA used outcomes focused metrics. The early review of the programme also signalled intent to make sure that the investment was being well targeted. With hundreds of people now enjoying a return to employment as a result of engagement on the programme the financial investment in the programme has been more than paid back. The roles obtained by IT Tallaght graduates are similar to those being obtained by other Computing graduates. The employment outcomes used by the HEA to determine the success of these programmes is perhaps a better metric than pure headcount or simple graduation numbers. This approach needs to be deployed carefully as there have been instances where moving to outcomes based metrics have driven poor behaviours.

3.3 Eligibility for the programme

For ICT Skills there are no fees for qualifying graduates. The programme was originally only intended to operate for 2-3 cycles but this has already been exceeded and there is a further call for proposals live at this point in time.

Graduates who are dependent on social protection payments but who haven't reached the threshold of being on those payments for 9 of the past 12 months cannot retain social protection benefits while on the programme. This restriction was relaxed for the first running of the programme using a special version of the Back to Education Allowance (BTEA) but this form of the BTEA is no longer available. In employment activation programmes this restriction makes sense as the focus is on activating long term unemployed.

It is frustrating with a programme that has a track record of success in addressing skills deficits critical to Ireland's economy that some excellent candidates are being excluded from participating on the programme.

4 Summary

Developing and delivering fast responses to complex technology industry needs is a role relevant to Institutes of Technology, or indeed a Technological University. The Institute of Technology consortium has successfully combined to deliver a quality programme with tight industry integration which addresses a national skills need.

The response to this programme also highlights the benefit of having a mix of academic staff with both industry and research focus in order to respond to a variety of needs. The programme has also provided a vehicle for better Academic Industry collaboration. Improved collaboration between Institutes has also been an outcome and indeed has led to better on the ground relations between the Computer Science/ Computing sections of the proposed merged DIT and TU4Dublin.

Finally, and most importantly, the lives of talented individuals who had suffered serious career interruptions have been transformed as they begin new careers in the ICT sector.

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